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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/542,123	12/09/2005	Vladimir Pavlovich Popov	U 015850-2	8400
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LADAS & PARRY 26 WEST 61ST STREET NEW YORK, NY 10023			EXAMINER JEFFERSON, QUOVAUNDA	
			ART UNIT 2823	PAPER NUMBER
			MAIL DATE 12/11/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.		Applicant(s)	
	10/542,123		POPOV ET AL.	
	Examiner		Art Unit	
	Quovaunda Jefferson		2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 September 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4 and 5-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan, US Patent 6,274,459 (as cited in a previous Office Action) in view of Chang, US Patent 6,289,605 and Farrens et al, US Patent 6,645,828.

Regarding claim 1, Chan teaches a method for producing a silicon-on-insulator structure including hydrogen implantation in a silicon wafer (column 6, lines 57-61), chemical treatment of the wafer and a substrate (column 7, lines 54-59. Note: while Chan teaches this cleaning process is done by one wafer, it is well known in the art that the cleaning process can be performed on both the transferring and receiving substrates in order to remove contaminates), joining of the wafer **2100** and substrate **2201** (figure 4), splicing and splitting of the wafer along a layer of the implanted hydrogen (column 8, lines 24-32 and figures 4 and 5), the improvements wherein are at least drying and removing of physically adsorbed substances from the surfaces of the

wafer and substrate after the chemical treatment is carried out at a first moderate temperature such that the implanted hydrogen stays bound (column 7, lines 59-60.

Note: Chan teaches that in hydrogen implantation into silicon has a critical diffusion temperature of 500°C, in which a temperature above this would cause the hydrogen to escape into the atmosphere. Therefore, in order to keep the hydrogen in the substrate, all processes performed before the separation phase would have to be lower than 500°C) and at least one of the joining and splicing of the wafer and substrate and exfoliating along the layer of implanted hydrogen is carried out at a second moderate temperature.

Chan fails to teach drying is carried out in a first vacuum and at least one of the joining and splicing of the wafer and substrate and exfoliating along the layer of implanted hydrogen is carried out at a second vacuum and the second moderate temperature is the same as or slightly higher than the first moderate temperature such that the implanted hydrogen mostly stays bound.

Chang teaches drying is carried out in a first vacuum (figure 5 and column 4, lines 46-50) by teaching a drying method that is used to remove DI water or other cleaning solutions from the surface of a semiconductor substrate by using a vacuum so that no static electricity exists to attract contaminants to the clean surface of the semiconductor substrate, thereby overcoming a shortcoming of the traditional spin-dry method.

It would be obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Chang with that of Chan because drying in a vacuum reduces the chance of static electricity to attract contaminants to the clean surface of the semiconductor substrate, thereby overcoming a shortcoming of the traditional spin-dry method.

Chan and Chang fail to teach at least one of the joining and splicing of the wafer and substrate and exfoliating along the layer of implanted hydrogen is carried out at a second vacuum and the second moderate temperature is the same as or slightly higher than the first moderate temperature such that the implanted hydrogen mostly stays bound.

Farrens teaches at least one of the joining and splicing of the wafer and substrate and exfoliating along the layer of implanted hydrogen is carried out at a second vacuum and the second moderate temperature is the same as or slightly higher than the first moderate temperature such that the implanted hydrogen mostly stays bound (column 3, lines 39-40 and column 5, lines 13-65) by teaching bonding of two silicon wafers together using a vacuum and temperatures of 300 degrees Celsius or less using a plasma which results in the bonded material being free from macroscopic and microscopic voids and having a stronger bonding strength.

It would be obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Farrens with that of Chan and Chang because bonding of two silicon wafers together using a vacuum and temperatures of 300 degrees Celsius or less using a plasma results in the bonded material being free from macroscopic and microscopic voids and having a stronger bonding strength.

Regarding claim 2, Chan teaches the hydrogen implantation is carried out through thermally grown oxide SiO₂ (column 6, lines 5-6).

Chan, Chang, and Farrens fail to teach with a thickness of 5 to 50 nm.

However, given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved See *In re Aller, Lacey, and Hall* (10 USPQ 23 3-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of ether the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that tile chosen dimensions are critical. *In re Woodruff*, 919 f.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Regarding claim 3, Chan teaches the hydrogen implantation is carried out with H_2^+ or H^+ ions with doses from 1.5 to $15 \times 10^{16} \text{ cm}^2$ and energies 20 to 200 keV, respectively (column 6, lines 26-31).

Regarding claim 5, Chan teaches thermal oxidation with following chemical etching with diluted hydrofluoric acid or a touch chemical-mechanical polishing (CMP) for removing an upper rough layer after the exfoliating (column 9, lines 53-67).

Regarding claim 6, Chan, Chang, and Farrens fails to teach a thickness of thermally grown oxide SiO_2 on the substrate is 0.01 to 3 μm .

However, given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved See *In re Aller, Lacey, and Hall* (10 USPQ 23 3-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

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An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Regarding claims 7 and 8, Chan teaches the substrate is glass and quartz
(column 7, line 44)

Chan, Chang, and Farrens fail to teach the substrate with a thickness about 500
 μm .

However, given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved See *In re Aller, Lacey, and Hall* (10 USPQ 23 3-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Regarding claim 9, Chang teaches at least one of the first and second temperatures is 80 to 350°C for 0.1 to 100 hours and at least one of the first and second tow-vacuums is 101 to 104 Pa (figure 5)

Chan, Chang, and Farrens fail to teach at least one of the first and second temperatures lasts for 0.1 to 100 hours.

However, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*,

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725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Regarding claims 10 and 11, Chang and Farrens teaches at least one of the first vacuum or temperature (Chang figure 5) is the same as the second vacuum or temperature (Farrens, column 3, lines 39-40).

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chan, Chang, and Farrens, as applied to claim 1 above, and further in view of Aga et al, US Patent 6,846,718 (as cited in a previous Office Action).

Regarding claim 4, Chan, Chang, and Farrens fail to teach a thermal annealing is carried out at 1100° C during 0.5 to 1 hour after splitting.

Aga teaches a thermal annealing is carried out after splitting (column 2, lines 1-7).as a means to flatten the delaminated surface

It would be obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Aga with that of Chan, Chang, and Farrens because the thermal annealing is carried out after splitting as a means to flatten the delaminated surface

Chan, Chang, Farrens, and Aga fails to teach a thermal annealing is carried out at 1100° C during 0.5 to 1 hour after splitting.

However, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Response to Arguments

Applicant's arguments with respect to claims 1-11 have been considered but are moot in view of the new ground(s) of rejection.

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Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quovaunda Jefferson whose telephone number is 571-272-5051. The examiner can normally be reached on Monday through Friday, 7AM to 3:30PM EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

QVJ
QVJ



FERNANDO L. TOLEDO
PRIMARY PATENT EXAMINER